

acyloxy; and m and n are integers of from 0 to 3 satisfying $0 \leq m+n \leq 3$) or a partially hydrolyzed condensate thereof; and

b¹ (b) organic bridged silane of the formula $R^3_p Y_{3-p} Si-M-SiR_{4q} Z_{3-q}$ (where each of R^1 and R^4 which may be the same or different, is a non-hydrolysable group selected from hydrogen, alkyl, fluorine-containing alkyl, alkenyl or aryl; each of Y and Z which may be the same or different, is a hydrolysable group selected from halide, alkoxy or acyloxy; M is alkylene or arylene group; and p and q are integers of from 0 to 2) or a cyclic oligomer with organic bridge unit (Si-M-Si), wherein the organic bridged silane is synthesized by reacting a silane monomer containing a Si-H with a silane monomer containing aliphatic unsaturated carbon ($-CH=CH_2$) in the presence of a catalyst.

7. (Amended) A process for preparing an organic silicate polymer having a flexible bridge unit in the network comprising the step of:

reacting the following component (a) with the following component (b) in an organic solvent after addition of water and catalyst:

(a) organosilane of the formula $R^1_m R^2_n SiX_{4-m-n}$ (where each of R^1 and R^2 which may be the same or different, is a non-hydrolysable group selected from hydrogen, alkyl, fluorine-containing alkyl or aryl group; X is a hydrolysable group selected from halide, alkoxy or acyloxy; and m and n are integers of from 0 to 3 satisfying $0 \leq m+n \leq 3$) or a partially hydrolyzed condensate thereof; and

B² (b) organic bridged silane of the formula $R^3_p Y_{3-p} Si-M-SiR_{4q} Z_{3-q}$ (where each of R^1 and R^4 which may be the same or different, is a non-hydrolysable group selected from hydrogen, alkyl, fluorine-containing alkyl, alkenyl or aryl; each of Y and Z which may be the same or different, is a hydrolysable group selected from halide, alkoxy or acyloxy; M is alkylene or arylene group; and p and q are integers of from 0 to 2) or a cyclic oligomer with organic bridge unit (Si-M-Si),

wherein the organic silicate polymer has a weight average molecular weight within a range of from 500 to 100,000.

8. (Amended) An interlayer dielectric film for a semiconductor device comprising an organic silicate polymer having a flexible bridge unit in the network prepared by crosslinking reaction between the following components (a) and (b):

(a) organosilane of the formula $R^1_m R^2_n SiX_{4-m-n}$ (where each of R^1 and R^2 which may be the same or different, is a non-hydrolysable group selected from hydrogen, alkyl, fluorine-containing alkyl or aryl group; X is a hydrolysable group selected from halide, alkoxy or acyloxy; and m and n are integers of from 0 to 3 satisfying $0 \leq m+n \leq 3$) or a partially hydrolyzed condensate thereof; and

(b) organic bridged silane of the formula $R^3_p Y_{3-p} Si-M-SiR_{4q} Z_{3-q}$ (where each of R^1 and R^4 which may be the same or different, is a non-hydrolysable group selected from hydrogen, alkyl, fluorine-containing alkyl, alkenyl or aryl; each of Y and Z which may be the same or different, is a hydrolysable group selected from halide, alkoxy or acyloxy; M is alkylene or arylene group; and p and q are integers of from 0 to 2) or a cyclic oligomer with organic bridge unit (Si-M-Si).

9. (Amended) A semiconductor device comprising an interlayer dielectric film comprising an organic silicate polymer having a flexible bridge unit in the network prepared by crosslinking reaction between the following components (a) and (b):

B (a) organosilane of the formula $R^1_m R^2_n SiX_{4-m-n}$ (where each of R^1 and R^2 which may be the same or different, is a non-hydrolysable group selected from hydrogen, alkyl, fluorine-containing alkyl or aryl group; X is a hydrolysable group selected from halide, alkoxy or acyloxy; and m and n are integers of from 0 to 3 satisfying $0 \leq m+n \leq 3$) or a partially hydrolyzed condensate thereof; and

(b) organic bridged silane of the formula $R^3_p Y_{3-p} Si-M-SiR_{4q} Z_{3-q}$ (where each of R^1 and R^4 which may be the same or different, is a non-hydrolysable group selected from hydrogen, alkyl, fluorine-containing alkyl, alkenyl or aryl; each of Y and Z which may be the same or different, is a hydrolysable group selected from halide, alkoxy or acyloxy; M is alkylene or arylene group; and p and q are integers of from 0 to 2) or a cyclic oligomer with organic bridge unit (Si-M-Si).

10. (Amended) A process for preparing an interlayer dielectric film for a semiconductor device comprising the steps of:

a) dissolving an organic silicate polymer in a solvent to obtain a solution, the organic silicate polymer having a flexible bridge unit in the network prepared by crosslinking reaction between the following components (i) and (ii):

(i) organosilane of the formula $R^1_m R^2_n SiX_{4-m-n}$ (where each of R^1 and R^2 which may be the same or different, is a non-hydrolysable group selected from hydrogen, alkyl, fluorine-containing alkyl or aryl group; X is a hydrolysable group selected from halide, alkoxy or acyloxy; and m and n are integers of from 0 to 3 satisfying $0 \leq m+n \leq 3$) or a partially hydrolyzed condensate thereof; and

(ii) organic bridged silane of the formula $R^3_p Y_{3-p} Si-M-SiR_{4q} Z_{3-q}$ (where each of R^1 and R^4 which may be the same or different, is a non-hydrolysable group selected from hydrogen, alkyl, fluorine-containing alkyl, alkenyl or aryl; each of Y and Z which may be the same or different, is a hydrolysable group selected from halide, alkoxy or acyloxy; M is alkylene or arylene group; and p and q are integers of from 0 to 2) or a cyclic oligomer with organic bridge unit (Si-M-Si);

- B²
- b) spin coating the solution obtained in step a) on a substrate to form a film;
 - c) drying the film obtained in step b) to obtain a dried film; and
 - d) curing the dried film obtained in step c) at a temperature of 300 to 500 °C,

whereby an interlayer dielectric film is obtained.

11. (Amended) A process for preparing a semiconductor device comprising an interlayer dielectric film, the process comprising the steps of:

a) dissolving an organic silicate polymer in a solvent to obtain a solution, the organic silicate polymer having a flexible bridge unit in the network prepared by crosslinking reaction between the following components (i) and (ii):

(i) organosilane of the formula $R^1_m R^2_n SiX_{4-m-n}$ (where each of R^1 and R^2 which may be the same or different, is a non-hydrolysable group selected from hydrogen, alkyl, fluorine-containing alkyl or aryl group; X is a hydrolysable group selected from halide, alkoxy or acyloxy; and m and n are integers of from 0 to 3 satisfying $0 \leq m+n \leq 3$) or a partially hydrolyzed condensate thereof; and

(ii) organic bridged silane of the formula $R^3_p Y_{3-p} Si-M-SiR_{4q} Z_{3-q}$ (where each of R^1 and R^4 which may be the same or different, is a non-hydrolysable group selected from hydrogen, alkyl, fluorine-containing alkyl, alkenyl or aryl; each of Y and Z which may be the same or different, is a hydrolysable group selected from halide, alkoxy or acyloxy; M is alkylene or arylene group; and p and q are integers of from 0 to 2) or a cyclic oligomer with organic bridge unit (Si-M-Si);

Appl. No. : 09/776,383
Filed : 02/02/2001

- B²
- b) spin coating the solution obtained in step a) on a substrate to form a film;
 - c) drying the film obtained in step b) to obtain a dried film; and
 - d) curing the dried film obtained in step c) at a temperature of 300 to 500 °C,
- whereby an interlayer dielectric film is obtained.
-